[The Emperor Otto III.]

THE RÖMER, AT FRANKFORT.

The town of Frankfort-on-the-Maine possesses a very ancient town-house, which derives its name, the *Römer*, from an upper hall, in which the emperors of Germany, called originally *Roman* emperors, feasted after their coronation in the adjoining cathedral. Till within a few years this hall was occupied by a series of busts of German emperors, of about equal value and authenticity to the portraits of the Scottish sovereigns still exhibited at Holyrood. These have been removed, and will be replaced by portraits in an infinitely better taste. The efforts made by a comparatively small town to elevate art, while they at the same time illustrate history and cultivate patriotic feelings, are so creditable, and have been carried into effect so well, that we are induced to notice the results as much from their intrinsic merit as from their affording examples not unworthy of imitation. Engraved copies of these new portraits are now in course of publication in a large folio size, beautifully coloured, under the title of 'The German Emperors, after the Pictures in the Imperial Chamber in the Römer at Frankfort-on-the-Maine, engraved on copper and coloured, with Lives of the Emperors, by Albert Schott.' The printed prospectus to this work affords us perhaps the best account of the motives and plan adopted, and from it we extract the following passages:—

"In the Römer, the ancient town-house of the town of Frankfort-on-the-Maine, yet exists the vaulted chamber which, in the last century, served for the solemn coronation festival of the German Empire, and from the balcony of which the newly consecrated emperor showed himself to the joyous people. On the long walls, close beside each other, are a row of pointed-arched niches, which fill the whole space. Till within a few years were to be seen two uniform rows of busts of the German emperors since Conrad I., with the laurel crown and toga of Cæsar—worthless creations of the seventeenth and eighteenth centuries.

"At the period (1813) when, through the fall of the power of Napoleon over Germany, the long-suppressed feelings of pride and patriotism again broke out in a bright flame, the idea arose of ornamenting this chamber, so rich in elevating recollections, more worthily, and in every niche to place a picture of a German emperor, as large as life and splendidly coloured. The undertaking, however, was not commenced till twenty-five years later, on the 18th of October, 1838, the anniversary of the battle of Leipzig, and now almost all the pictures are finished.

"The pictures, fifty-two in number, extend from Charlemagne to Francis II., and include the whole history of the German Empire. Three and thirty artists, chiefly of Frankfort, Düsseldorf, and Vienna, have been employed upon them. The greater number of these works show, in a creditable manner, the great progress in art which Germany has made within the last thirty years. Actual portraits of all are not to be reasonably expected, as the pictorial art in Germany, and perhaps generally throughout Europe, exhibits few examples of efforts at resemblance before the end

of the thirteenth century, until which time the contemporary representations satisfy us merely in respect to costume and general character. Since Rudolf of Hapsburg, the monuments of some of the emperors are still remaining, from which, even though imperfect, yet presenting the marked features of countenance, the painters of the Imperial Chamber have been enabled to delineate faithful portraits in the present sense of the word. But of the emperors of the last four centuries, we may confidently affirm that the greater number are likenesses, as with the commencement of the modern period more exactitude is found. Even for those emperors for whom the artists had no such assistance, the most strenuous advocate for historical truth may grant his applause, as art has many means, even when the precise features are unknown, of giving to a celebrated man the correct figure. A certain disposition uniformly gives certain features; through a long succession of ancestors a family resemblance is acquired; the exterior, when time has properly developed it, stands in close relation to a man's general character; and the lives of many of the emperors present moments which, as it were, make their whole being physically apparent. It is thus possible, even where the reality is lost, to rescue the truth, and Frankfort will possess a truth-speaking picture-gallery of German history."

In order to show the manner in which the undertaking has been carried into effect, we give the following table of subjects, with their artists:—

Period of reign.	Emperors.	Painters.	Contributed by
768—814	Charlemagne	Philip Veit	Frankfort Art-Union
814—840	Louis the Pious	J. J. Jung	Ditto
840—876	Louis the German	Charles Trost	Senator Reuss and Landamtmann Benkard
876—887	Charles the Gross	Ditto	Frankfort Art-Union
887—899	Arnulph	J. J. Jung, after P. Veit's designs	Senator Reuss and Landamtmann Benkard
899—911	Louis the child, young		
911—918	Conrad I.	Charles Ballenberger	Art Institute at Stade
919—936	Henry I.	J. B. Zwecker	Governors of the Orphan-House
936—973	Otto I.	Philip Veit	King of Prussia
973—983	Otto II.	Adolphus Teichs	Mrs. Nies and J. N. du Fay
983—1002	Otto III.	Joseph Lettegart	Senator Dr. Souchay and his lady
1003—1024	Henry II.	J. D. Passavant	J. D. Passavant
1024—1039	Conrad II.	Lorenzo Clasen	Dusseldorff Art-Union
1039—1056	Henry III.	H. Stilke	Ditto
1056—1106	Henry IV.	Otto Mengelberg	Ditto
1106—1125	Henry V.	P. J. Kiederich	Ditto
1125—1137	Lothaire	E. Bendemann	Baron A. M. von Rothschild
1138—1152	Conrad III.	Dr. Ferd. Fellner	Dr. Ferdinand Fellner
1152—1190	Frederick I., Barbarossa	G. F. Lessing	Senates of Hamburg and Lübeck
1190—1197	Henry VI.	J. B. Zwecker	A patriotic union of citizens of Frankfort-am-Maine
1197—1208	Philip of Swabia	Alfred Rethel	The family of Neufville
1197—1215	Otto IV.	Maurice Oppenheim	Baron A. M. von Rothschild
1215—1250	Frederic II.	P. Veit	Alexander Bernus and Bernus du Fay
1273—1291	Rudolph of Hapsburg	Gustavus Lasinsky	Counsellor Schlosser
1292—1298	Adolphus of Nassau	H. K. A. Mücke	Duke of Nassau
1298—1308	Albert I.	Edward Steinle	Prince Metternich
1306—1313	Henry VII.	P. Veit	Count of Nassau (late King of the Netherlands)
1314—1347	Louis of Bavaria	C. Ballenberger	King of Bavaria
1314—1330	Frederic of Austria	Dr. F. Fellner	Several citizens of Frankfort
1347—1378	Charles IV.	Francis Brentano	The Society of the Evening Circle at Frankfort
1349	Gunther of Schwartzburg	C. Ballenberger	Maurice von Bethman
1378—1400	Wenzel (Wenceslaus)	Wm. Hensel	Senators Newberg, Souchay, and Passavant
1400—1410	Rupert the Palatine	C. Ballenberger	A Bavarian Union, by — Von Mieg
1410—1437	Sigismund	Philip Foltz	Frankfort Art-Union
1438—1439	Albert II.	Jos. Binder	Count von Münch-Bellinghausen
1440—1493	Frederic III.	Julius Hübner	Julius Hübner
1493—1519	Maximilian I.	A. Rethel	Mrs. L. Contard and J. F. Contard-Wichelhausen
1519—1556	Charles V.	Ditto	Art Institute at Stade
1556—1564	Ferdinand I.	John Ender	Emperor of Austria
1564—1576	Maximilian II.	A. Rethel	The Metzler family
1576—1612	Rudolph II.	Charles Hemerlein	Union of patriotic citizens at Mentz
1612—1619	Mathias	Jos. Danhauser	Emperor of Austria
1619—1637	Ferdinand II.	Peter Kraft	Ditto
1637—1657	Ferdinand III.	E. Steinle	Senate of Bremen
1658—1705	Leopold I.	Leopold Kupelwieser	Archduke Francis Charles
1705—1711	Joseph I.	Ditto	Archduke Louis
1711—1740	Charles VI.	— Waldmüller	Emperor of Austria
1742—1745	Charles VII.	M. Heiler	A Bavarian Union, by — von Mieg
1745—1765	Francis I.	Natale Schiavoni	Emperor of Austria
1765—1790	Joseph II.	M. Oppenheim	St. John's Lodge (Freemasons ?), Frankfort-am-Maine
1790—1792	Leopold II.	L. Kupelwieser	Archduke Charles
1792—1806	Francis II.	Ditto	Emperor of Austria

The portraits of the emperors are accompanied in the German publication by memoirs of each sovereign, written in a concise and eloquent style by Albert Schott; but as it is as a work of art that the subject is here treated, it will only be necessary to indicate sufficient of the history to show the characteristics of the individuals we have selected, particularly where, as in the present case, the portrait is imaginative.

Otto III. was the son of Otto II. by Theophania, a Grecian princess, and in 983 succeeded his father when only three years of age. After a short but splendid career, his exertions having been mistakenly directed

towards the establishment of an Italian empire, and the latter part of it embittered by feelings of religious remorse, he died at Rome in 1002, of a pestilential fever, while employed in quelling an insurrection in that city.

The artist has represented him in the period of his greatest brilliancy, when about seventeen years of age; and the writer gives the following descriptive reasoning on which the characters of feature and form have been chosen:—"Otto was certainly handsome: the son of the beautiful Greek, her speaking mien and eyes lived in him again; while we recognise the German in the light yellowish-red colour of his hair and the down on his young chin; the fair northern skin is embrowned by the sun of Rome, of which we are reminded by the old-fashioned Romish street, the castle of St. Angelo in the background, and the cloudless sky:* the manly ripeness of expression, the earnestness in his beautiful mouth, could scarcely have been otherwise in one so burdened with weighty cares, the son of a race so quickly and strongly developed. That Otto possessed all these advantages, without wanting better qualities, is shown by the lively glow on his cheeks, the mild elevation of the spiritual forehead, the nobleness and lightness of his whole figure. His rank is shown by the golden sphere resting in his left hand, while his right grasps the staff of empire."

We may add, that the originals, though nearly completed, are not yet placed in their proper positions; they are deposited in a separate room, and exhibited to visitors for a trifling fee.

Public Baths for the Working-Classes.—Every one acquainted with the many causes of crime, and who is aware that the only rational hope of effectually suppressing crime, must be in the removal, one by one, of these numerous causes, must look with pleasure on the movement among the working classes, now going on in Edinburgh and elsewhere, to improve the general health by the establishment of public baths. In two ways is sickness found to generate crime; first, by enfeebling a man's powers, it makes the toil of honest industry more severe to him, and exposes him to the temptation of seeking a living by easier, though dishonest means: and secondly, and in a yet more terrible way, by cutting off the lives of virtuous parents in the prime of manhood, it casts their children on the wide world, without parental guidance, and often without adequate support of any kind. How fearfully sickness acts in this manner is shown by the large number of orphan children who are always to be found in prison; and how far an attention to personal cleanliness, combined with other causes, tends to prevent sickness and death, may be conceived by the fact, that although during a considerable part of the past year fever has raged among the poorer classes, both in Edinburgh and Glasgow, yet at the same time in the prisons of these cities, where great regard is paid to personal cleanliness, and where the prisoners frequently bathe, not a single case of fever has originated, nor, when brought in by any prisoner, has the disorder spread to others.—*Mr. Frederick Hill's Ninth Report on Prisons (Scotland).*

Importance of Iron.—Sweden had a still stronger attraction for the warlike tribes from the interior of Asia, who were pressing upon the population of Europe South of the Baltic, and which has been overlooked by the historians who treat of the migrations of mankind from or to the North in the rude ages. Sweden alone had iron and copper for arms and utensils close to the surface of the earth, and, from the richness of the ores, to be obtained by the simplest process of smelting. This natural advantage must, in those ages, have made Sweden a rallying-point for the Asiatic populations coming into Europe from the North of Asia, and from countries destitute of the useful metals in any abundant or easily-obtained supply. To them Sweden was a Mexico or Peru, or rather an arsenal from which they must draw their weapons before they could proceed to Germany. This circumstance itself may account for the apparently absurd opinion of the swarms of Goths who invaded Europe having come from Scandinavia; and for the apparently absurd tradition of Odin or the Asiatics invading and occupying Scandinavia in preference to the more genial countries and climes to the South of the Baltic; and for the historical fact of a considerable trade having existed from the most remote times between Novogorod and Sweden, and of which, in the very earliest ages, Wisby, in the Isle of Gotland, was the entrepôt or meeting-place for the exchange of products. The great importance of this physical advantage of Scandinavia in the abundance of copper and iron, to an ancient warlike population, will be understood best if we take the trouble to calculate what quantity of iron or copper must have been expended in those days as ammunition, in missile weapons, by an ordinary army, in an ordinary battle. We cannot reckon less than one ounce weight of iron, on an average, to each arrow-head; from twenty to twenty-four *drop*, or an ounce and a quarter to an ounce and a half, being considered by modern archers the proper weight of an arrow: and we cannot reckon that bowmen took the field with a smaller provision than four sheaves of arrows, or heads for that number. A sheaf of twenty-four arrows would not keep a bowman above ten or twelve minutes; and in an ordinary battle of three or four hours, allowing their arrows might be picked up and shot back in great numbers, we cannot suppose a smaller provision belonging to and transported with a body of bowmen than ninety-six rounds each; which, for a body of four thousand men only, would amount to above fourteen tons' weight of iron in arrow-heads alone. For casting spears or javelins, of which in ancient armies, as in the Roman, more use was made than of the bow, we cannot reckon less than six ounces of iron to the spear-head, or less than two spears to each man: and this gives us nearly two tons' weight more of iron for four thousand men as their provision in this kind of missile. Of hand-weapons, such as swords, battle-axes, halberds, spears, and of defensive armour, such as head-pieces and shields, which every man had, and coats of mail or armour, which some had, it is sufficient to observe that all of it would be lost iron to the troops who were defeated, or driven from the field of battle, leaving their killed and wounded behind; and all had to be replaced by a fresh supply of iron. We see in this great amount of iron or bronze arms, to be provided and transported with even a very small body of men in ancient times, why a single battle was almost always decisive, and everything was staked upon the issue of a single day; and we see why defeat, as in the case of the battle of Hastings and many others, was almost always irrecoverable with the same troops: they had no ammunition on the losing side after a battle. We may judge from these views how important and valuable it must have been for an invading army of Goths, or whatever name they bore, coming from Asia to Europe, to have got possession of Sweden; so important, indeed, that it is reasonable to believe that if ever an Asiatic people invaded Europe north of the Carpathian mountains, the invaders would first of all proceed north along the Vistula and other rivers falling into the Baltic, and put themselves in communication, by conquest or commerce, with the country which supplied their ammunition; and would then issue armed from the North, and break into the Roman empire, and be considered as a people coming originally from some Northern hive. Scandinavia certainly never had food for more human beings than its present inhabitants, and could never have poured out the successive multitudes who, by all accounts, are said to have come in from the North upon the Roman provinces.—*Laing's Chronicle of the Kings of Norway.*

The Origin of Fogs.—The very common but mistaken idea, that the fog which we see of an evening hanging over low meadows, and by the sides of streams, is ascending, arises very naturally from our first observing it in low places, and as the cool of the evening advances, remarking that it ascends to higher land: the fact is, however, not that the damp is ascending, but that from the coldness of those situations they are the first place which condense the before invisible vapour, and as the cold of the evening advances this condensation takes place at a higher level. A large portion of the vapour ascends to the upper regions of the atmosphere, where it cools, and becomes visible to us in the form of clouds; and increasing in density by cooling, they gradually descend nearer to the earth, until at last becoming too condensed by the loss of heat, they fall in rain, to be again returned in endless succession.—*Scientific Phenomena of Domestic Life.*

* These refer to the original painting in the Hall, and are only faintly indicated in the engraving.

LOCOMOTION OF ANIMALS.—No. IX.

The Bat (Cheiroptera).—Bats present locomotive organs of a very peculiar construction. Destined like birds to move in the air, their skeleton is adapted in conformity to that purpose. The bones are light, the body small, the arms and fingers greatly developed, to afford a great number of points for the attachment of the delicate membrane of which the wing is partly composed, as may be observed in the annexed figure of the short-eared bat. The hand of the bat rotates outwards and inwards like the wing of a bird, so that when the wing is folded the little finger lies on the smaller bone of the fore-arm. The thumb is not included in the membrane of the wing, but projects beyond its margin, where it forms a hook for holding objects. The four succeeding fingers support the membranous wing, which when expanded presents an extensive surface for striking the air during flight. The legs are small, twisted, and so weak as to be incapable of supporting the body when on the ground. The toes, terminating in sharp claws, are well adapted for grasping elevated objects, to which the animal suspends itself in an inverted position; by this means it can easily launch itself into the air on the slightest alarm.

As the bat is incapable of chasing and capturing its prey on the ground, and its food is chiefly composed of insects taken on the wing, it requires the attainment of a much greater velocity of movement than it would be able to accomplish by means of its lower extremities, were they even much stronger than they are. It has, therefore, been furnished with a peculiar apparatus adapted to aerial progression, as has been already described. Such being the case, we shall postpone the statement of the principles on which the power of flight in the Cheiroptera depends, until we take into consideration the flight of animals in general.

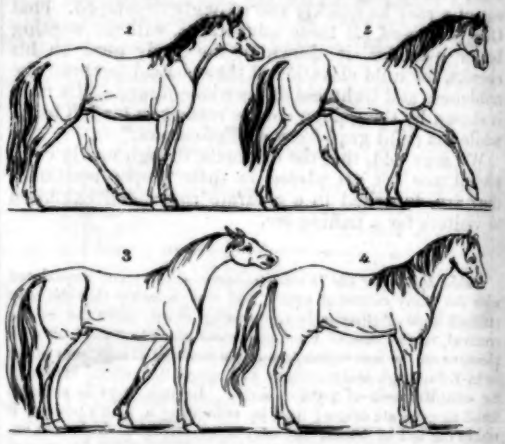
Quadrupeds.—The movements of quadrupeds differ in principle from those of bipeds, and also from those of hexapods.

In all quadrupeds the axis of the trunk is directed more or less horizontally, the angle of inclination depending chiefly on the difference between the length of the anterior and posterior extremities. In some animals—the giraffe, for instance—the fore-legs are the longest, and the axis of the trunk inclines upwards; in others, such as the hare, greyhound, and especially the jerboa and kangaroo, the hinder limbs preponderate in length: the axis consequently (supposing the animal to stand with the four feet on the ground) inclines anteriorly downwards. The difference between the lengths of the anterior and posterior limbs produces a very sensible effect on the movements of such animals.

In quadrupeds the weight of the body is transmitted to the ground by means of their four legs, but we shall find on examination that they do not all bear an equal share of the burden, and that the different species present a diversity of structure which influences their movements very perceptibly. In the elephant, for example, the legs are nearly straight, a conformation which enables the animal to support the mass of its body with the greatest mechanical advantage: but, great as it is well known to be, the strength of the bones and muscles of its legs is far from being in proportion to the mass of its body when compared with that of many smaller quadrupeds; and we consequently find that the speed of the elephant is not proportional to its bulk.

Quadrupeds move their four legs either singly and successively, and in various orders, which correspond with the different velocities of the animal. These different kinds of movement of the legs are known under the terms walking, trotting, galloping, and leaping.

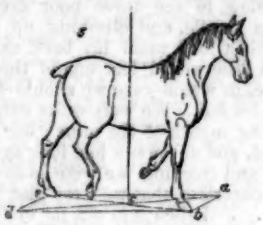
As everybody is familiar with the horse, we shall select that animal to illustrate the manner in which the locomotion of quadrupeds in general is effected. The subject possesses more or less interest to most persons, yet of the millions of people who are in the daily habit of seeing the horse in motion, how very few consider the means by which the movements of that valuable animal are performed. Let us suppose the horse to be standing on its four legs, as in *Fig.* 4, and that it com-



mences the walking step by moving its left hind-leg, as in *Fig.* 1; this having been advanced and placed on the ground, the right fore-leg is next raised and advanced, as in *Fig.* 2, and having been placed on the ground, the right hind-leg performs a similar movement, and the legs of the animal are in the position *Fig.* 3; lastly, the left fore-leg is advanced, and placed in the position of *Fig.* 4. These four movements complete the step, and during the series the centre of gravity of the animal passes over a corresponding space. This is the order in which nearly all quadrupeds move their legs in slow walking; but some authors do not coincide in this statement, amongst whom is Borelli, who has figured the horse as moving both the legs on the same side at once in walking, as some horses are taught to do in the *amble*, and as the giraffe is said to do naturally.

A little consideration will clear up the error into which Borelli and others have fallen respecting the horse. It will be observed from the foregoing statement that the left hind-leg moves first; the right fore-leg second; the right hind-leg third; and the left fore-leg fourth. Now if we do not analyse this order of motion from its commencement, we may easily be deceived; for in walking by a horse, the two legs appear indeed to move together on the same side, but this arises from the continuity of the series of movements, which we find begins with the left hind-leg, and terminates with the left fore-leg; being in like manner the movement of the right fore-leg followed by that of the right hind-leg; which continuity of movement, if not carefully discriminated, gives an impres-

sion that the animal moves both legs on the same side simultaneously.



The Trot.—In trotting, the horse moves its legs in pairs diagonally: thus, if the legs *a d* (*Fig.* 5) be raised and advanced first, the legs *b e* will be raised the instant those designated by *a d* reach the ground. On the other hand, when the legs *b e* are raised before the legs *a d* reach the ground, there is a minute interval during which all the legs are raised above the ground at the same time. In trotting each leg moves rather more frequently in the same period of time than in walking, or nearly as 6 to 5. But the velocity acquired by moving the legs in pairs, instead of consecutively, depends on the circumstance that, in trotting, each leg rests on the ground a short time, and swings during a long one; whilst in walking each leg swings during a short period, and rests during a comparatively long one. In walking, the trunk oscillates laterally, whereas in trotting it oscillates vertically; but in each of these kinds of movement there appears to be a slight motion of the trunk of the animal both laterally and vertically.

It may be observed that the vertical line traversing the base of support passes through the horse in such a manner as to leave by far the greater part of the weight of the body to be supported by the two fore-legs.

The Gallop.—In galloping, the horse adopts three different methods of using its organs of locomotion, which are distinguished by the number and the order in which the feet reach the ground.

First order of motion.—When a horse begins to gallop on the right, the left hind-leg reaches the ground first; the right hind-leg and left fore-leg next follow at the same time, and the right fore-leg last. This is called the gallop of three beats.

Second order of motion.—If the four legs reach the ground in succession, the left hind-foot reaches the ground first, the right hind-foot second, the left fore-foot third, and the right fore-foot fourth. This is the gallop of four beats, sometimes denominated the canter. This order of movement is not adapted for great speed, but is an agreeable motion in riding on horseback for ladies, or for gentlemen who ride lazily, or badly.

Third order of motion.—In this kind of action the horse moves the legs in the same order as in trotting; that is, the left hind and right fore feet reach the ground simultaneously, then the right hind and left fore feet. This is the order in which the feet move in racing, and whenever the greatest speed is required. It is called the gallop of two beats.

Leaping.—In leaping, the horse raises the fore-legs from the ground, and projects the body upwards and forwards by the hind-legs alone. It is well known that they leap rivulets, hedges, and ditches, with great ease, even under the burden of heavy riders; but to accomplish this an enormous expenditure of muscular action must required; since the muscles which produce the effect act at a great mechanical disadvantage.

Horses which are constituted for great speed have the shoulder-joints directed at a considerable angle with the arm. Saintbell has given the relative proportions of the several parts of the skeleton of the celebrated race-horse Eclipse, together with the angles of inclination and range of motion belonging to the joints of the legs. According to his account, that horse, when galloping at liberty, and at its greatest speed, passed over twenty-five feet at each step: these strides were taken two and a half times in a second, being at the rate of about four miles in six minutes and two seconds, or forty miles in an hour and twenty seconds.

Those quadrupeds are best adapted as beasts of burden, or to take long and often repeated journeys, which have the anterior and posterior limbs of nearly equal length, such for instance as the horse, ass, camel, and many other animals, and these have also the power of ascending and descending hills with ease and safety. But such is not the case with those quadrupeds in which the length of the anterior and posterior extremities is remarkably disproportionate. The hare, for example, has the hinder legs much longer than the anterior ones; the consequence of which is, that when pursued, it can often outstrip the greyhound in running up the sides of hills, but in descending it must run in a zigzag direction, or it would tumble over. The rabbit presents the same conformation. In the jerboa and kangaroo the length of the posterior legs predominates exceedingly over that of the anterior, and their mode of progression is effected by a succession of leaps produced by the simultaneous action of their hinder extremities. When pursued, the jerboa is said to clear nine feet at each leap, and so rapidly that the Cossacks, through mounted on the fleetest horses, are unable to overtake it. In these leaps the body flies through the air with the legs inclined backwards as in *Fig.* 7).

In the kangaroo the length of the hind-legs is nearly double that of the fore-legs, which is a disproportion far too great to permit them to move with the same advantage as other quadrupeds. When the kangaroo rests on its four legs, the head and trunk incline to the ground, as seen in *Fig.* 8. They usually sit on the two haunches, using the tail as the third leg of a tripod, as in *Fig.* 6.

Amongst the Ruminantia, the deer and the antelopes are beautifully organized for speed, but as they move on the same principles as the horse, we need not stop to dwell on them.

It may be remarked that those animals which are least furnished with the means of defence, and are least protected, are often endowed with the greatest speed of motion; such as the hare, antelope, deer, &c. On the other hand, the lion, tiger, leopard, and carnivor-

ous quadrupeds which are endowed with great strength, have not the speed of the above-mentioned animals. This shows that with the same number of locomotive organs, the speed of an animal depends on other conditions besides mere strength. The structure of the several joints, the relative length of the different portions of the limbs; the proportion which the length of the limbs bears to that of the body; the angular disposition of the limbs with respect to each other; the distances at which the muscles act with respect to the axes of the joints; all concur to modify the speed of an animal, independently of its muscular power; and these circumstances, the details of which may be found in works on comparative anatomy, vary considerably in different animals. In all the diversified forms of quadrupeds we observe their organization beautifully adapted to fulfil the destiny allotted to them by the all-wise governor of the universe.

THE MINING SYSTEM OF CHILI.

Mr. Darwin the naturalist, in the narrative of his researches in South America, gives some details of the mining system as generally carried on in Chili and other parts of that continent. In an earlier volume of the Magazine we noticed the localities and modes of excavating the chief gold and silver mines; but a few details may here be given, from Mr. Darwin's work, respecting some peculiarities in the South American system generally.

In an old Spanish law in operation in Chili, every encouragement is given to the search for mines. The discoverer may work a mine in any ground, by paying five shillings; and before paying this he may try, even in the garden of another man, for twenty days. There are copper-mines in which the men go through a very hard ordeal for a very small remuneration. They have little time allowed for their meals; and during both summer and winter they begin when it is light, and leave off at dark. (In Chili the summer days are shorter and the winter days longer than in England). They are (at the mines of Jajuel) paid one pound sterling a month, together with food. This food consists of sixteen figs and two small loaves of bread for breakfast, boiled beans for dinner, and broken roasted wheat grain for supper. They scarcely ever taste meat. They have to clothe themselves and to support their families with twelve pounds a year.

But this kind of work is slight to that which is undergone by the men at some mines which were visited by Mr. Darwin, and which had been visited many years before by Sir Francis Head. On arrival at the gold-mines of Yaquil [Jajuel], Mr. Darwin was surprised at the pale appearance of the men; but he soon found sufficient reason for it. The mine is four hundred and fifty feet deep, and each man brings up nearly two hundred-weight of ore. With this load they have to climb up the alternate notches cut in the trunks of trees placed in a zig zag line up the shaft. The men (who are quite naked, except drawers) ascend with this great load from the bottom of the line. Even beardless young men, eighteen or twenty years of age, do this, although they have little muscular development of body.

Sir Francis Head says:—"While the *barreteros*, or miners, were working the lode, the *apires* were carrying the ore upon their backs; and after we had made the necessary observations, and had collected proper specimens, we ascended, with several of these apires above and below us. The fatigue of climbing up the notched sticks was so great, that we were almost exhausted, while the men behind us (with a long stick in one hand, in the cloven end of which there was a candle) were urging us not to stop them. The leading apire whistled whenever he came to certain spots, and then the whole party rested for a few seconds. It was really very interesting, in looking above and below, to see these poor creatures, each lighted by his candle, and climbing up the notched stick with such a load upon his back, though I occasionally was a little afraid lest one of those above me might tumble, in which case we should have all preceded him in his fall. We were quite exhausted when we came to the mouth of the mine; one of my party almost fainted, and as the sun had long ago set, the air was so bleak and freezing, we were so heated, and the scene was so cheerless, that we were glad to hurry into the hut. . . . I then sent out for one of the apires with his load. I put it on the ground and endeavoured to rise with it, but could not, and when two or three of my party put it on my shoulders, I was barely able to walk under it. The English miner who was with us was one of the strongest men of all the Cornish party, yet he was scarcely able to walk with it, and two of our party who attempted to support it were altogether unable, and exclaimed 'that it would break their backs.' The load which we tried was one of specimens which I had paid the apire to bring up for me, and which weighed more than usual, but not much, and he had carried it up with me, and was above me during the whole of the ascent."

Mr. Darwin says, that notwithstanding this severe labour, the apires live entirely on boiled beans and bread; they would prefer the bread alone, but the masters, finding that they cannot work so hard upon this, insist on their eating the beans also. Their pay is from twenty-four to twenty-eight shillings a month. They leave the mine only once in three weeks; when they stay with their families for two days. As a means of preventing the men from abstracting any of the gold or gold-ore (for it is of a gold-mine that Mr. Darwin is speaking), the owners establish a very summary and stringent tribunal. Whenever the superintendent finds a lump of ore secreted for theft, its full value is stopped out of the wages of all the men; so that they are obliged to keep watch over each other, each having a direct interest in the honesty of all the rest.

The Chilian miners are full of peculiarities. The amount of labour they undergo is greater than that of slaves, generally so called; yet as they are to a certain extent masters of their own actions, they bear up against what would wear down most men. Living for weeks together in the most desolate spots, when they descend to the villages on feast-days there is no excess or extravagance into which they do not run. They occasionally gain a considerable sum, and then, like sailors with prize-money, they try how soon they can contrive to squander it. They drink excessively, buy quantities of clothes, and in a few days return to the mines without a penny, there to resume their laborious mode of life. It is observed by Mr. Darwin that this thoughtlessness, as with sailors, is the result of the mode in which they are made dependent upon others rather than on themselves. Their daily food is found them, and they acquire no habitual care as to the means of subsistence; while the temptation to enjoyment and the means of paying for it occur at the same times. Far different is this from the system observed in Cornwall; where the men, by having a direct interest in the good management of the mine, learn to think for themselves, and form a highly intelligent body of men. The Chilian miners wear a peculiar and rather picturesque dress; consisting of a very long shirt, of some dark-coloured baize, with a leathern apron, fastened round the waist by a brightly coloured sash; very broad trowsers; and a small cap of scarlet cloth fitting closely to the head.

It is necessary to bear in mind that the miners here spoken of are a different set of men from the apires,

who are those that bring up the heavy burdens. The miners dig the ore from the bowels of the mine; while the apires are simply labourers, such as the bricklayers' labourers, with whose appearance we are familiar, but who carry much less heavy loads, and up a much less height with a much better constructed ladder. The following remarks by Mr. Darwin will further illustrate the extraordinary kind of labour which these men undergo voluntarily; for voluntary it must be called when viewed in relation to acknowledged slavery, since the men are not obliged to accede to the employer's terms, although in effect the country is so poor and ill-regulated that the men have very little choice. "According to the general regulation, the apire is not allowed to halt for breath, except the mine is six hundred feet deep. The average load is considered as rather more than two hundred pounds, and I have been assured that one of three hundred pounds (twenty-two stones and a half) by way of a trial has been brought up from the deepest mine! At the time the apires were bringing up the usual load twelve times in the day, that is, two thousand four hundred pounds from eighty yards deep; and they were employed in the intervals in breaking and picking ore. These men, excepting from accidents, are healthy and appear cheerful. Their bodies are not very muscular. They rarely eat meat once a week, and never oftener, and then only the hard dry charqui (dried beef). Although with a knowledge that the labour is voluntary, it was nevertheless quite revolting to see the state in which they reached the mouth of the mine; their bodies bent forward, leaning with their arms on the steps, their legs bowed, the muscles quivering, the perspiration streaming from their faces over their breasts, their nostrils distended, the corners of their mouth forcibly drawn back, and the expulsion of their breath most laborious, each time, from habit, they utter an articulate cry of 'ay-ay,' which ends in a sound rising from deep in the chest, but shrill like the note of a fife. After staggering to the pile of ores, they emptied the 'carpacho;' in two or three seconds recovering their breath, they wiped the sweat from their brows, and, apparently quite fresh, descended the mine again at a quick pace. This appears to me a wonderful instance of the amount of labour which habit (for it can be nothing else) will enable a man to endure."

There is a great amount of ignorance manifested among the Chilian and La Plata miners, on points which in England constitute part and parcel of the mining system. At a copper-mine Mr. Darwin was told that the Chilian miners had no conception of the value of copper pyrites (a rich ore of copper) until informed of the circumstance by miners from this country: the Chilians laughed at the English for entertaining such a notion; but the English afterwards turned the laugh against them, by making a profitable use of some veins of this ore, which they had bought for a mere trifle.

The mining system in that country is generally conducted somewhat as follows:—There are two principal persons concerned in almost every mine, the proprietor and the habilitador: the first, who is also the actual miner, lives at his hacienda, or farm, generally in the neighbourhood, and attends to the details of working and melting the ore. The habilitador resides at one or other of the sea-port towns; he is the mining capitalist, by whose means the miner is enabled to proceed with his work. The habilitadors are generally diligent and prudent men; while the proprietor or miner is too often improvident. The proprietor farms his own ground, on the banks of a stream; obtaining from his farm vegetables and sometimes live-stock for the subsistence of his working miners. The melting-house is also generally built on his hacienda, and the ore is brought to his door on the backs of mules. These farmer-miners rarely undertake to work a mine with their own unassisted capital; they are seldom sufficiently wealthy, and when they are so, it is found ultimately more advantageous to share with the habilitador, who takes charge of the commercial part of the business. In some instances, the miner is so utterly without funds that he is at the mercy of the habilitador, who makes what terms he pleases, which the other has scarcely an option to refuse or accept, since he has no means of paying the wages of his men, and carrying on the operations, without the aid of the capital provided by the habilitador.

The Chilian system has, however, undergone a good deal of change by the introduction of English capital and modes of proceeding: although the English capitalists themselves have not had a very flattering return for the money so invested, except in some rare instances.

THE CHAMPAGNE DISTRICTS OF FRANCE.

We have no spots in England analogous to the wine-districts of France. The cultivation of the grape is in too backward a state in this country to allow of the wine-manufacture being brought to an important extent. Perhaps the nearest approach to such a system is exhibited in the cider-districts of Devonshire and Herefordshire, where the inhabitants, for one generation after another, cultivate large orchards of apple-trees for the express purpose of preparing this beverage. In the midland parts of France, however, the wine-system (if we may so term it) exhibits many interesting features worthy of note.

The name of *Champagne*, which is so familiar as that applied to a choice variety of French wines, is the name of one of the provinces into which France was divided before the Revolution. The province has been since subdivided into several "departments," and the old name is not now officially applied to the district; but if nothing else should keep the name of Champagne in remembrance, the wine which is named after it will effectually do so. The district of Champagne lies eastward of Paris, intervening between the metropolis and the country around Strasbourg. Rheims, Epernay, and Château-Thierry, are three of the principal spots in the heart of the wine-district; especially Epernay, on the road from Paris to Châlons-sur-Marne.

For the manufacture of the *white* champagne wines black grapes are generally used. They are gathered in the morning, while the dew is yet on them; and it is remarked that, when the weather is foggy at the time of the vintage, the produce of the fermentation is considerably increased. The wine obtained from the first pressure is called *vin d'élite*, and is always kept apart from the rest. The liquor is collected in small vats, whence it is removed early in the following day into puncheons which have been previously sulphured; in these the *must* undergoes a brisk fermentation, and is allowed to remain till towards the end of December, when it becomes bright. It is then racked, and fined with isinglass, and in a month or six weeks more it is racked and fined a second time. In the month of March it is bottled; after it has been six weeks in bottle it becomes brisk, and towards autumn the fermentation is often so powerful as to occasion a considerable loss by the bursting of the bottles. The loss thus sustained, which is seldom less than twenty per cent., is one of the causes which tend to enhance the price of the wines. To procure *pink* champagne, the grapes are first slightly trodden and freed from the stalks; and the fermentation is allowed to commence before they are subjected to the press, in order to faci-

litate the solution of the colouring-matter. In making the *red* wines, the grapes are trodden before they are introduced into the vat; sometimes the treading is repeated during the fermentation. The marc, or stalky refuse, is covered by a board, and a layer of straw is commonly employed to protect the frothy head from the contact of the atmospheric air.

Miss Costello, in her 'Pilgrimage to Auvergne,' has given many interesting details concerning the Champagne district, which further illustrate the place and its people. Wine-making is deemed such an important part of the industrial arrangements of the district, that pamphlets are continually appearing, as well as works of larger bulk, relating to professed improvements in the method of cultivating the vine, or in the manufacture of the wine. There does not appear, however, to have been much change in the mode of proceeding during half a century. At that time, Arthur Young the agriculturist visited the wine-caves of Epernay, then the property of M. Lasnier and M. Dorsé; and the same caves are now occupied for a similar purpose by M. Moët, a wine-merchant whose name is well known to the connoisseurs in champagne. These wine-caves are quite remarkable, and unparalleled by anything of the kind in England. They form an intricate labyrinth of subterranean passages in some chalk-hills near Epernay. It would take a whole day to ramble all through them, and from one end to the other there is nothing but wine, wine. When Arthur Young visited them, they contained fifty or sixty thousand bottles of champagne; but at the present time M. Moët has the enormous quantity of three millions of bottles of this costly wine there deposited. The wine is kept in the caves three years before being sent out, and the quantity is kept up by renewals as fast as the old wine is removed.

To the same firm of Moët also belongs the vineyard of Hautvilliers, one of the most choice of the wine-producing estates. It was formerly one of the rich possessions of the Benedictines, every trace of whose convent is now swept away, although the vineyard remains in a flourishing state.

The most advantageous position for planting the vines is on the south-eastern slope of a hill. The summits of hills are too much exposed to winds; while the bottoms of valleys and plains, although fitted for the growth of the wood of the vine, does not answer so well for the ripening of the grapes. In past times very great attention was paid to the choiceness of the growth, in order that this, rather than quantity, should give the reputation to the place. Philippe le Hardi issued an ordinance in 1395, expressed in these words:—"Understanding that on the hill where the best wine in the kingdom is grown, and of which our Holy Father the Pope, our Lord the King, and many other great lords are in the habit, by preference, of making provision, there has been of late planted *gamais*, a bad plant which has many times deceived and defrauded foreign merchants, by which much injury and loss has been sustained, it is hereby ordered that the *déloyal gamais* shall be cut and extirpated in a month from this time, under penalty of a fine of sixty sous each plant."

Those vines are said to be the best which are planted in *cordons* and run on trellises; but many are still grown on single props. It is not uncommon to observe, between the ranks of vines, beans and potatoes; but this is a custom not approved by the best judges. Judicious pruning is regarded as a point of the first consequence, as much so, indeed, as the position of the vineyard or the quality of the plant. The *vigneron*, or vine-dresser, is a husbandman on whose skill much depends; and it often happens that a person so engaged is himself a proprietor of vines: a state of things which sometimes leads to the neglect of his employer's vineyard while attending to his own.

The connexion between the flavour of the grapes and the flavour of the wine is not so close as many might suppose. It does not by any means follow that a grape pleasant to the palate produces a pleasant wine; for, in the course of the fermentation, and of the different operations necessary to bring out the real qualities of the fruit, many minute chemical changes occur, which render the quality of the wine a very uncertain point. The kind of vine called *pinot* is reputed to produce the best wine; yet there are but few champagne vineyards planted with it: because, though the wine is superior, the produce is so small that the expense of cultivation is scarcely compensated by the price. For this reason, this kind of grape is mixed with others of lesser value, to produce what is called *vin pinots*. If the very finest kind be required, it is necessary to keep all inferior varieties at a distance; for if a pinot-vine be surrounded by inferior plants called troyons, the flavour of the fruit of each will partake of that of the other.

Miss Costello, after speaking of some disasters which the town of Epernay had suffered in the troubled events of former times, remarks:—"The vines, however, flourish through all troubles, and are not only splendid in quality, but beautiful to the eye. Indeed, the whole drive from Epernay to Château-Thierry, which was our next destination, is exquisite, constantly varied and picturesque, and glowing with abundance: corn, vines, and fruit heaping the earth with riches; gardens of roses and orchards of crimson cherries along the road, with every here and there pretty villas belonging to the wine-merchants peeping from their shrubberies, and prospects of extreme beauty opening from the summit of the hills, with the bright Marne winding at their feet."

The Rhône, as well as the Marne, presents its gently sloping hills clothed with vineyards. At a spot about two miles from Valence is the village of St.-Peray, around which are hills on whose slopes an almost uninterrupted vineyard extends, producing very beautiful grapes wherever a south-eastern aspect can be obtained. The grape when ripe assumes a beautiful golden hue; its taste is cloyingly sweet, and the saccharine matter which exudes often covers the branches with a brown stain. From these grapes is produced a sparkling wine of a wholesome quality and a delicate rosy tint. The vintage takes place about the middle or end of September, and the juice is at once transferred to the cask, before the fermentation has begun, and remains there for six or seven months, during which time it is fined. In March or April it is bottled, and remains two or three years to mature, and allow the dregs to deposit. The bottles are piled up in stacks, each row separated by laths, to allow the bottles which burst (and they form fourteen or fifteen per cent. of the whole) to be withdrawn. After this the wine is racked, that is, each bottle is taken out, and is thrust neck downwards into a hole cut in a board. By this means the dregs sink down gradually into the neck; and as they descend, day by day, the bottle is tilted more and more until its position is nearly vertical. To expedite the falling of the sediment, the bottles are lifted and set down with a jerk once or twice a-day; and, after receiving two or three hundred of these jerks, the bottle is taken up, and the sediment is discharged by cutting the string and letting the cork fly, and with it the lees at the neck of the bottle, but as little of the wine as possible. The vacancy thus caused is filled with clear wine; and this process of corking and uncorking is repeated two or three times, until no more sediment is deposited.